

The Impact of Small Businesses on Critical NASA Space Missions¹

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Abstract—This paper describes the dramatic contributions of small, minority and women owned businesses to the most critical missions of America's Space Program since 1992. Such feats did not occur by accident, however. Rather, they were the end result of NASA's unique mission-oriented approach to small and disadvantaged business utilization.

Through strategic organization, meticulous planning, timely execution and continuous learning, NASA rose from having a marginal small business program to one now seen as a model throughout the Federal government and the world.

The benefit to NASA has been the delivery of high quality goods and services by small businesses at less cost. It has also meant a broadening of public support for the funding of its major technical projects and programs. Most important, however, is the fact that NASA's emphasis in this area has caused it to function better as an agency.

For small businesses this has meant significantly more NASA prime and subcontract dollars, a better quality of contracts and, for many, the freedom from dependence on NASA contracts for survival.

NASA's unequivocal success in this arena should cause many governmental and private entities to rethink its traditional approach to small and disadvantaged business utilization.

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1. INTRODUCTION

Over the years the utilization of small businesses in prime and subcontracts at the National Aeronautics and Space Administration (NASA), particularly those owned by minorities and women, has gone from a chore of statutory compliance to one of technical necessity. Just a decade ago such firms were primarily used in the fields of construction and other non-high tech support service contracts. Today, however, they are engaged in such mission critical activities as developing subsystems for complex spacecraft, building non-rocket-powered vehicles to fly at hypersonic speed, and manufacturing hardware for the International Space Station.

They are also involved in more complex service-oriented contracts, such as space shuttle-related software development, safety and mission assurance, systems engineering, construction of mission control facilities, and the design of inter-planetary spacecraft.

The most intriguing aspect of this phenomenon is not why or how it happened but the fact that it *did* happen. NASA's utilization of small and disadvantaged businesses over the past decade contradicts every cliché about such firms with regard to the quality of their performance, their ability to hold down cost and the durability of their business infrastructures.

NASA's successful journey in this now important arena is a model for not only the aerospace industry but for the entire Federal government in demonstrating how the giving of serious, top-level attention to small and disadvantaged business utilization can build a more popular, productive and profitable organization.

2. THE GOLDIN TOUCH

Shortly after the arrival of Daniel S. Goldin as NASA's

¹ U.S. Government work not protected by U.S. copyright

new administrator in April 1992, he faced some major challenges. The incoming head of NASA's House Appropriations Subcommittee, Congressman Louis Stokes (D.Oh), had been extremely critical of the agency's record in contracting with minority businesses.² Moreover, the election of 1992 produced 112 House freshmen, most of them promising to cut budgets, beginning with that of NASA. In addition, the 1986 tragedy of Space Shuttle "Challenger" was still fresh in the minds of many.

Mr. Goldin saw all of these factors as related. His stated desire was to give NASA back to the American people. In internal correspondence to his senior managers he had stated that he did not see running the agency on a tighter budget with less people as inconsistent with higher productivity or with increasing contracting with small, minority and women-owned businesses. In fact he had favorable experiences in utilizing such firms on high tech projects in the corporation he had left to become the head of NASA. Thus, he made small and disadvantaged business utilization as high a priority in his plan to restore public confidence in NASA as taking on riskier technical projects with less funding to do so.

Unlike other government agency heads, Goldin decided to take a business, rather than a socioeconomic, approach to the issue of small, minority and women-owned business contracting. The objective was to match the skills of the best high-tech small businesses in the country with the specific needs of the NASA mission. If such action could be accomplished with any kind of consistency, NASA dollars to such firms would not only significantly increase, but the quality of the work going to them would be meaningful as well.

Thus, the concept of QQI was developed. This was a strategy whereby NASA would develop initiatives, programs, and processes designed to: increase the **quantity** of prime and subcontract dollars going to small, minority and women-owned firms; improve the **quality** of contracts and subcontracts let to such firms; and, effect the **institutionalization** of those initiatives, programs and processes which led to the first two objectives into permanent NASA procurement policy.

With the successful implementation of such strategy NASA expected to also: 1) broaden public support for the agency and its major technical programs; 2) ensure the delivery of better goods and services to NASA at the best practicable value; 3) comply with all Federal laws and regulations regarding small business; 4) facilitate the independence of small disadvantaged businesses from NASA contracts; and, 5) become a world model small

business program. As will be demonstrated, none of these expectations were utopian or unrealistic.

3. BROADENING PUBLIC SUPPORT

Nowhere was the impact of the new promotion of small disadvantaged business utilization at NASA more profound than on the International Space Station. In 1993 Congress was almost evenly split on whether funding for the multi-billion project should continue. It was NASA's priority project and formed both the basis and the rationale for most of the upcoming space missions. If NASA lost the space station, many feared that the agency would lose a major reason for its existence and would end up looking like a shell of its former self.

In June of 1993 Congress was set to vote on a bill that would eliminate funding for the space station. The House of Representatives was the first body to vote on the bill, and if the vote was unfavorable to NASA there, it would be an uphill battle for the agency to prevail in the Senate.

The vote was tied and the future of the ambitious project fell into the hands of Congressman John Lewis (D. Ga.), a member of the Congressional Black Caucus who seldom voted in NASA's favor. Shortly before his decisive vote, Administrator Goldin told him NASA's plans for building minority business participation in both NASA contracting overall and the space station itself.

He told Congressman Lewis that although minority business participation in terms of space station dollars hovered at around one (1) percent, he promised that the situation would significantly improve in the future.³ Thus assured, the congressman voted against the elimination of the funding and the space station was saved.⁴

It is interesting to note that on that same day the Department of Energy's multi-billion dollar Super Colliding Super Conductor project was voted down, even though it was near the middle of completion.

The impact of the space station vote proved to be a historical turning point for broadening public support for NASA. At the time of the 1993 vote only a handful of minority members of Congress voted in support of NASA for anything. And even in the 1993 vote, only 14 of 39 members of the Congressional Black Caucus voted in favor of NASA and that was considered high for that time. Today, NASA enjoys three-quarters of the Congressional Black Caucus vote, two-thirds of the vote of the Congressional Hispanic Caucus vote, and half the votes of the Congressional Women's Caucus. All of this

² Baka, Ken, "Stokes Takes on NASA and Vows More Changes," *City Reports*, January 28, 1993, p. 1, 10

³ Thomas, Raiph C. III, "Back to the Future," *Minority Business Entrepreneur*, May/June 1999 p. 44

⁴ Cooper, Kenneth J., "Revamped Space Station Project Barely Survives Vote in House," *The Washington Post*, June 24, 1993, p. A27

is due to NASA keeping its promise with regard to small disadvantaged business participation on the International Space Station.

Minority businesses now account for more than 10 percent, or more than \$1 billion, of the total contract dollars being spent on the space station since its redesign in 1994. They have performed some of the most high tech aspects of the project.

For example, Cal Tron Systems, Inc., an African American owned firm, located in Carson City, California, developed and manufactured five sensor and effector simulators, a hardware based system that was installed into the space station's integration laboratory. The parts simulate ground testing of problems, which could occur on the space station and allow for corrective solutions for the future safety of the astronauts.⁵

A Native American-owned firm, Frontier Electronic Systems, of Stillwater, Oklahoma, produced the space station's "extravehicular maneuvering unit audio control panel." This panel enables the astronaut, who is assembling the space station outside the spacecraft, to communicate with astronauts inside the vehicle during his or her "space walk."⁶

In May 2001 a Canadian astronaut connected the robotic arm to the space station during a space walk. BST Systems, a Hispanic-owned company, located in Plainfield, Connecticut, manufactured the batteries for the astronaut's backpack, which allowed him to breathe.

These are just a few examples of how small disadvantaged businesses have provided critical support to the International Space Station. It is also interesting to note in the Space Station vote taken in the House in 2001, NASA prevailed by more than 200 votes.

4. ENSURING BETTER GOODS AND SERVICES

In expanding its competitive base of contractors to include more small, minority and women owned firms, NASA had to ensure that the high quality of the goods and services it had been accustomed to receiving would improve, or at the very least, remain the same.

Drawing from the principles of Total Quality Management, NASA's Office of Small and Disadvantaged Business Utilization (OSDBU) developed a unique driving philosophy for its organization, defining its products and its customers.

It specified its **products** as small, minority and women-owned businesses and its **customers** as the buyers of

goods and services within both NASA (including its 10 field centers) and its major prime contractors. It was the function of the OSDBU then to shape, prepare, and market its products (small businesses) so they could be confidently "purchased" and successfully utilized by its end-users, the customers (buyers).

Thus, the ensuing programs and initiatives that were developed by the OSDBU would be based upon what the buyers needed to accomplish their missions at NASA. For example, a three-day intensive course entitled, "Training and Development for Small Businesses in Advanced Technologies," was created to train small business owners in the mechanics of bidding to, marketing to, performing for, and closing out contracts with NASA. It has now trained more than 1500 small business owners and executives.

For the more advanced small businesses, quarterly and semi-annual contractor forums were set up which allowed them to present their technical capabilities to buyers at the various NASA field centers. To develop minority and women-owned businesses in unique high tech fields, NASA started a Mentor-Protégé Program, which provides contractual incentives for major prime contractors to develop small business protégés in such arenas.

To encourage small businesses to commercialize space technology, the OSDBU facilitates an A to Z two-day course on "How to Commercialize NASA Technology." These are just some of the many programs and initiatives that NASA has developed to facilitate the increased utilization of small, minority and women-owned businesses.

The performance of the firms ultimately used on NASA contracts and subcontracts, both in terms of quality of work and cost savings, has been no less than phenomenal.

In 1996, for example, the services of a small disadvantaged business called Murietta Circuits of Anaheim, California, was pivotal in saving a major NASA program. The Galileo mission involved sending a spacecraft 2.5 billion miles over a six-year period to the planet Jupiter. Galileo's mission was to photograph and gather data on the gaseous planet and its moons and to release a probe into the planet's turbulent atmosphere.

After the Galileo spacecraft was launched, however, the main antenna failed to properly unfurl. This meant that most of the data generated from the spacecraft's mission could not be transmitted back to Earth. NASA engineers reconfigured a secondary antenna, however, that transmitted data at an extremely low rate. In fact it was 10,000 times weaker than the signal from the primary antenna. Murietta's role was to assist NASA in its efforts to enhance Galileo's signal strength through the secondary antenna.

⁵ See Footnote 3 at p. 45.

⁶ Ibid at 45-46

Through a process called the "Full Spectrum Initiative," the NASA engineers reconfigured the antenna so that it could relay data at about 100 times the secondary antenna's rate of transmission. Murietta Circuits manufactured all of the electronic boards for the Full Spectrum Initiative. It produced these highly sophisticated boards and delivered them finished, tested, and manufactured to NASA's high reliability standards, *on time, within budget, and with zero defects.*

As a result, 70 percent of the data generated by the Galileo Mission was recovered. The data that was successfully relayed back to Earth from Galileo included 1500 photographic images of Jupiter and its moon and extensive information about the powerful magnetic field that surrounds the giant planet.⁷

In July 1997 the Mars Pathfinder landed successfully and safely on the Red Planet. It was mankind's first encounter with rocks on another planet. The lander part of the spacecraft was expected to transmit Mars' data to NASA for about one month. The manufacturer of the batteries that provided the power for such transmission was a small disadvantaged business, BST Systems of Plainfield Connecticut. It is important to note, however, that although BST's contract with NASA's Jet Propulsion Laboratory called for the batteries to last for one month they instead lasted for *three months*. Furthermore, small disadvantaged businesses performed well in other parts of the project. In fact the Lead Procurement Manager on the project noted the following:

SDB's won and performed big jobs on Mars Pathfinder. There has been a misconception in certain spheres that small business means "small jobs." On Mars Pathfinder, we learned that small businesses can successfully step up to big jobs.⁸

And, most importantly, he noted that:

For the toughest jobs, small high tech firms came through with outstanding talent, flexibility and affordable prices.⁹

In 1998, the Lunar Prospector rocketed off pad 46 at Spaceport Florida's new commercial complex at Cape Canaveral. The spacecraft orbited about 63 miles above the Moon's surface gathering data remotely. It did this much like a camera takes measurements on the amount of light being reflected or emitted by objects in its field-of-view without ever coming into actual contact with them.

⁷ "High Tech SDB Supports Galileo," *Opportunity Quarterly*, (A Newsletter of the NASA OSDBU), Spring, 1997, p.6

⁸ Taylor, Randall L., "Destination: Fourth Rock from the Sun," *Minority Business Entrepreneur*, Vol. 14, No. 3, p. 37, May/June 1997

⁹ Ibid

The Lunar Prospector's mission was to provide definitive evidence on the existence or absence of water ice in the shaded lunar polar regions. The spacecraft was equipped to detect 10 or more key minerals, such as iron, titanium, and rare Earth elements as well as any tectonic and volcanic activity on the Moon. In addition, it was geared to map the lunar magnetic and gravitational fields.

Symtech Corporation, a small disadvantaged business in Arlington, Virginia, created and maintained the website for the mission. The website was hailed by television network CNN as NASA's "best ever."¹⁰ The website recorded *15 million hits* only *four days* into the mission. It contains more images, videos, and data about the Moon than any other single location in history. The site offers 50,000 images and will grow to a staggering total of about 2 million stills by the mission's end.

Also in 1998, a non-minority woman-owned business, Bergaila Engineering Systems (BES) of Houston, Texas, won NASA's Mentor Protégé of the Year Award, because of her unique, high tech performance as a subcontractor to Johnson Engineering Corporation, a small business located in Webster, Texas.

Prior to its NASA experience, BES was primarily serving the refining, petrochemical, and pipeline industries with high-level engineering services, which included "finite element analysis." During its mentor-protégé relationship with Johnson Engineering, BES used finite element analysis software to transfer engineering practices and principles from the petrochemical/refining industry to the aerospace industry.

The company designed, analyzed, fabricated, and delivered an International Space Station Airlock Module Astronaut Trainer for use in the Neutral Buoyancy Laboratory under tight schedule constraints. In accomplishing these tasks, BES saved NASA \$400,000 in costs.

Moreover, BES demonstrated exceptional performance in meeting critical schedule requirements for the NASA Engineering & Robotics Group by providing a Payload Bay Trainer *nine weeks earlier* than proposed by other bidders – and at approximately *one half the cost*.¹¹

In December 1999 the crew of the Space Shuttle "Discovery" installed a new computer into the \$3 billion Hubble Space Telescope during its successful servicing of the super-large observatory situated in outer space. The computer is 20 times faster with six times more memory than its predecessor. This computer dramatically

¹⁰ "SDB Creates Web Site for Lunar Prospector," *Opportunity Quarterly*, Summer, 1999, p.8

¹¹ "Woman-Owned Business Earns NASA Award for Space Station Work," *Opportunity Quarterly*, Summer, 1999, p. 8

increased the telescope's capabilities, reduced maintenance and significantly lowered operational costs. Jackson & Tull, a small disadvantaged business, located in Washington, D.C, built the computer.¹²

Meanwhile, in May 2000, a unique technology by Dynacs Engineering of Clearwater, Florida, another small disadvantaged business, prevented a launch delay of Space Shuttle "Atlantis," which was on its way to the International Space Station for a critical servicing mission. Two weeks prior to the shuttle's launch, a critical hydraulic system component aboard the spacecraft failed a routine test.

It was determined that a 320-pound power drive unit (PDU) which controls the Orbiter's speed brakes and tail rudder was defective and would require replacement prior to launch. The replacement of this component had never been attempted with the shuttle in the vertical position on the pad. The normal replacement of this component is performed at the Kennedy Space Center's Orbiter Processing Facility (OPF) with the orbiter in a horizontal position. In an effort to prevent a postponement of Atlantis the shuttle program managers explored options on how to perform this replacement of components on the shuttle launch pad.

The key technical challenge was how to simultaneously cap six (6) titanium hydraulic lines that lead to and from the PDU to allow removal of the unit and prevent air intrusion into the system during component replacement. Dynacs engineers came up with a concept to freeze (-180 degreeF) the hydraulic fluid inside the pipe and create "frozen plugs" by wrapping liquid nitrogen (LN2) cooled tubing around the outside of the titanium lines. Dynacs built a full-scale model of the hydraulic lines, and the concept to freeze the line was successfully demonstrated just three days after the initial request from shuttle management. Two days later, Dynacs installed its system on the six titanium lines on Atlantis and started the process to establish and maintain the "frozen plugs" throughout the 30-hour PDU change-out process. In just two more days the PDU and hydraulic system was tested and accepted for launch.

Space Shuttle Atlantis was successfully launched on May 19, 2000 and docked with the International Space Station on May 29, 2000. Dynacs personnel were credited with preventing a launch delay and for saving possibly millions of dollars in additional shuttle processing time through their innovative approach to the problem.¹³

¹² Thomas, Ralph C. III, "The Impact of High Tech Small Businesses on Critical NASA Space Missions," **Cooperative Symposium on Programs to Support the Innovation and the Development of Small Business in Finland and the United States: A Review of Current Policy and Research**, Helsinki, Finland, September 21-22, 2000

¹³ Wells, Melissa, "Rocket Science for All," **Maddux Report**, p. 10

Such examples are just a few of the numerous success stories in which NASA experienced a higher quality of goods and services at less cost with its increased utilization of small, minority and women owned businesses.

5. STATUTORY AND REGULATORY COMPLIANCE

The Early Years

NASA's maximization of its utilization of small and disadvantaged businesses also resulted in its first-time, total compliance with various Federal laws and regulations dealing with small businesses. Since 1990, for example, NASA was under a Congressional mandate, Pub. L. No. 101-144, to award at least 8 percent of its total prime and subcontract dollars to small disadvantaged businesses. Even through Fiscal Year 1992, however, it had never met the goal.

Under Pub.L.No. 95-507 NASA was required, as are all other major Federal agencies, to meet prime and subcontract goals negotiated each year with the U.S. Small Business Administration (SBA) for small, small disadvantaged, 8(a), and women-owned small businesses. The agency had no more than what one would describe as a "checkered success" in that area.

It should be pointed out that while "goals" are not generally thought of as "mandates," Federal agencies must explain to the SBA at the end of each fiscal year why they did not meet a certain goal or goals. The SBA in turn sends such explanations to the House and Senate Committees on Small Business.

Repercussions for Federal agencies that do not meet goals on a regular basis can be quite significant. NASA's Space Station experience in 1993 is a good example. The rule of the day then is that small business goals are a reasonable calculation of what a given agency is expected to do on an annual basis, and they are expected to be met.

Arriving at NASA in the middle of the 1992 fiscal year, Administrator Goldin took immediate steps to generate the "quantity" aspect of the QQI strategy. First, he made meeting the various small business goals the responsibility of all of his Associate Administrators. Moreover, he inserted this clause into their performance appraisals as a critical evaluation factor, thus affecting their bonuses, promotions and professional advancement.¹⁴

Next, he addressed his attention to the Office of Small and Disadvantaged Business Utilization (OSDBU). OSDBU's were established in each government agency

¹⁴ Thomas, Ralph C. III, "A Giant Step for NASA," **Minority Business Entrepreneur**, May/June 1993

having procuring authority by Federal legislation in 1978. It made such offices responsible in part for facilitating, promoting and monitoring the use of small and disadvantaged businesses in the contracts and subcontracts of their respective agencies. The heads of such offices, usually entitled "Directors", were required by law to report to either the head of the Federal agency or to his or her deputy.¹⁵

In most of the Federal government, however, this was not happening. Not only were OSDDBU's, including that of NASA, located in agency basements, but they were usually relegated to handing out agency materials to small businesses either at their offices or at various small business conferences regularly held around the country. Generally speaking, they did not report to anyone near the top of the agency.

Mr. Goldin elevated the head of the OSDDBU's position at NASA from Director to Associate Administrator, thereby making that person equal to all of the other technical and program senior managers who reported directly to him. NASA then conducted a national search to choose an experienced small business advocate who was most fit for the job.¹⁶

His third action was to establish a Minority Business Resource Advisory Committee (MBRAC) under the Federal Advisory Committee Act (FACA).¹⁷ This committee would consist of minority and women business owners in addition to representatives of large businesses and minority oriented universities. Its function would be to advise NASA on how to better utilize small disadvantaged businesses in its contracts as well as the subcontracts of the agency's major prime contractors.

MBRAC now holds four meetings a year at NASA headquarters and its field centers. The Committee receives briefings from major program managers on the extent of small disadvantaged business participation in their contracts as well as projections for upcoming opportunities for such firms. Essentially, the Committee gathers facts, analyzes facts and makes recommendations to NASA, where appropriate. To date, NASA has accepted more than 90 percent of the Committee's recommendations.

Fourth, Mr. Goldin invoked a seldom-used provision in Federal law to gain special Congressional approval for setting aside \$310 million in contracts for small disadvantaged businesses. In his petition to Congress he stated that the existing legislative vehicles were not enough to allow NASA to meet the legislatively-

mandated 8 percent goal for small disadvantaged businesses.¹⁸

In addition, Mr. Goldin wrote letters to the heads of NASA's top 50 prime contractors, as well as the Aerospace Industries Association, indicating that he wanted more subcontract dollars to go to small disadvantaged businesses.¹⁹

These immediate and dramatic steps taken in the middle of the fiscal year caused NASA to jump from 6 percent in FY 1991 to 7.2 percent in FY 1992 with regard to its 8 percent goal.

Arrival of the Associate Administrator

Ralph C. Thomas III was selected by Administrator Goldin as NASA's first Associate Administrator for Small and Disadvantaged Business Utilization in November 1992. He is the person who coined the strategy "QQI" concept and immediately set out to put it into practice.

Working closely with MBRAC, his office developed the most unique initiatives ever seen in the Federal government for increasing the utilization small disadvantaged businesses. At that time, for example, Federal law provided that all government contracts over \$500,000, or \$1 million in the case of construction contracts, must have numerical subcontracting goals which provided maximum practicable opportunities for small and small disadvantaged businesses. In all Federal agencies up to that time, the goals were usually determined through negotiation between the prime contractor and the contracting officer - usually *after* the contract had been awarded, severely diluting the agency's negotiation leverage.

NASA decided, however, that it would be the determinator of what numerical subcontracting goal represented "maximum practicable opportunities" for small disadvantaged businesses and such figure would be put in the Requests for Proposal and/or contract solicitations. Most importantly, and also a first for the Federal government, NASA expressed subcontract goal percentages in terms of "total contract value" rather than a percentage of the amount of the contract that was to be subcontracted.

In most of the Federal government, for example, if a contract has a total value of \$10 million, and half of that amount (\$5 million) is expected to be subcontracted, a 10 percent goal would mean 10 percent of \$5 million or \$500,000.00. Under NASA's method, however, the 10

¹⁵ See Pub. L. No. 95-507

¹⁶ See Footnote 14

¹⁷ Fox, Jarilyn Dansby, "NASA Forms Resource Advisory Committee, *Minority Business News*, April 15-May 15, 1993, pp. 40, 57

¹⁸ "Increasing Minority Contracts is the Goldin Rule at NASA," *Space Business News*, May 25, 1993, pp. 4-5

¹⁹ "NASA First Federal Agency to Use Non 8(a) Minority Setasides; Will Meet 8% SDB Goal," *Minorities in Business Insider*, May 19, 1993

percent figure would be of total contract value (\$10 million) and the dollar figure would be \$1 million. This would give NASA a more accurate picture of how many dollars in a contract were actually going to small disadvantaged businesses.

The NASA OSDBU also initiated a "Uniform Methodology for Determining Subcontracting Goals for Small Disadvantaged Businesses." The policy, which was coordinated with the entire senior management of the agency, consists of an across-the-board process for quantifying the "maximum practicable" subcontracting opportunities for small disadvantaged business on each applicable contract. A numerical goal, expressed as a percentage of the "total contract value", is included in all pertinent solicitations.

This methodology proved to be so successful that it was expanded for use in determining subcontract goals on individual contracts for small businesses overall, including women owned businesses.

In addition, the prime contractor's ability to address how it would achieve such goals in its competitive proposal would be scored in the source selection process. The OSDBU's goal was to make such factor count as much as 150 points under "mission suitability" section, which was usually a total of 1000 points.

Moreover, to ensure that the prime contractors lived up to their subcontract commitments after receiving the contract, NASA counted 15% of their award fee toward their progress in meeting their small disadvantaged business subcontract goals. Most NASA contracts are cost plus award fee.

To complement the agency's emphasis on subcontracting, Mr. Thomas established a Prime Contractor's Roundtable in November 1993, consisting of NASA's top 25 major contractors. The purpose of the Roundtable was to discuss innovative ways of subcontracting to small disadvantaged businesses. The Roundtable meets at least three times a year. Since its inception, subcontract dollars doubled from \$555 million in FY 93 to \$1.1 billion in FY 2000.

In fact, NASA now subcontracts a higher percentage of its total contract dollars to small *and* small disadvantaged businesses than any other Federal agency.

Even with its aggressive subcontracting initiative, NASA also began to step up its use of existing *prime* contract vehicles for the increased utilization of small and disadvantaged businesses. In 1993 the agency obtained special approval from the White House to conduct the "Mid-Range Procurement Initiative," meaning that all contracts between values of \$25,000 and \$500,000 (subsequently raised to \$100 thousand to \$2 million) would be automatically reserved for small businesses,

assuming that a small business was available that could do the work.²⁰

Mid-Range contracts made up about 83 percent of NASA's procurement actions, but only accounted for about 11 percent of its total contract dollars. The program helped to increase the quantity of prime contract dollars going to small businesses overall. This process is also faster, cutting significantly the time and paperwork involved in other procurements.

NASA also made liberal use of the Small Business Administration's (SBA) 8(a) Business Development Program. This program provides Federal government contracts and other assistance to small businesses certified by the SBA to be owned by socially and economically disadvantaged individuals. **This does not mean that the goods or services provided by such firms are "disadvantaged" or impaired, however.**

It only means that Congress has determined that such firms are in a disadvantaged competitive position in the market place due to historical factors beyond their control and that this is harmful to the nation in that it can not enjoy the full productive capacity of its citizenry, thereby affecting the smooth functioning of the country's economy. Thus, a limited amount of special governmental assistance has been allowed to give such firms a fair opportunity to achieve competitive viability. They can be in this program for a maximum of nine (9) years, and then they graduate.

Under 8(a) Program authority, the SBA enters into contracts with other Federal agencies to supply goods and services, and subcontracts the actual performance of the work to 8(a) Program participants.

NASA used this program to award some of the largest contracts ever awarded to 8(a) firms. The largest was a \$264 million contract from NASA's Goddard Space Flight Center in Greenbelt, Maryland for engineering support services in 1993. At that time it was the largest 8(a) contract in Federal history. The firm performed so well that in 2001 the contract is still in the 8(a) program. NASA also awarded 8(a) contracts for \$180 million at its then-Lewis Research Center in Cleveland, Ohio and another one for \$150 million at its Kennedy Space Center in Cape Canaveral, Florida.²¹ In both cases the firms performed in an outstanding manner, saving the agency money and spurring new technologies. Both contracts are still in the 8(a) program.

It is important to note, however, that NASA did not use the 8(a) Program merely for large contracts. Its point was

²⁰ "MidRange Procurement Procedure (Pilot Test Program)", **At A Glance: Procurement Initiatives**, NASA Office of Procurement, May, 1994

²¹ David, Leonard, "NASA Stresses Outreach for Disadvantaged Firms," **Space News**, February 14-20, 1994

to show that small businesses could perform at any level. Thus, the size of contracts to small disadvantaged businesses still covered a wide range from small to large.

Increasing the Quantity

"If you can't measure it, you can't manage it!" That was a phrase coined by Administrator Goldin in 1992, and it caused the OSDBU to develop metrics for the entire agency on its progress with small, small disadvantaged and women-owned businesses.²² Such metrics were provided on a monthly, semi-annual, and annual basis. It indicated to the agency where NASA was in relation to its small business goals negotiated with the SBA and the 8 percent goal mandated by Congress. It has been NASA's experience that once numbers are shown, they go up!

Although NASA promised Congress it would meet the 8 percent goal by FY 1994, it actually met it by FY 1993, one year ahead of schedule, achieving 8.5 percent. Such figure has increased virtually every year and at the end of FY 2000 it had risen to 18.3 percent, or \$2 billion – *triple* what it was in FY 1991, before the initiation of the aggressive program. The prime and subcontract dollars to small businesses overall has jumped from \$2.2 billion in FY 91 to \$3.5 billion in FY 2000.²³

Prime and subcontract dollars to women-owned businesses tripled from \$176 million in FY 1991 to \$543 million in FY 2000. Also in FY 2000, and for the first time ever, NASA exceeded *all* of the small business goals it negotiated with the SBA. It should be noted that all of these accomplishments resulted from gradual, but significant, increases over the years.²⁴

Improving the Quality

Just as important as increases in the quantity of contracts going to small, minority and women-owned firms was the improvement of the **quality** of contracts they received. Improvement of quality would mean the amount of dollars such firms received in high tech contracts. Thus, NASA's first act was to define "high-tech." NASA's OSDBU initiated the definition and coordinated it throughout the agency, even seeking comments on it from the **Federal Register**.

The definition of "high tech" work that was decided upon was as follows: Research and/or development efforts that are within or advance the state of the art in a technology discipline and are performed primarily by

professional engineers, scientists, and highly skilled and trained technicians or specialists.

NASA then matched this definition against Standard Industrialization Classification (SIC) codes (now designated as the North American Industrialization Classification (NAIC) codes) maintained by the SBA, which define specialty or work categories. This then provided the measurement standard by which NASA would evaluate its performance of improving the quality of contracts going to small disadvantaged businesses.

To accomplish this task the NASA OSDBU established a number of initiatives already mentioned earlier in this paper, and they were all a success. In the **Quarterly Aeronautics Small Disadvantaged Business Forum**, for example, three or four highly sophisticated small disadvantaged businesses are permitted to present their technical capabilities to high-tech buyers of goods and services at NASA's four aeronautics research centers. Some of the participating firms were awarded \$70 million in contracts and subcontracts from November 1993 to November 2000. One of the firms, Sierra Monolithics, of Redondo Beach, California, rose from a \$2 million firm in 1995 to a near \$200 million company in 2001, utilizing a technology it developed on one of the contracts it obtained as a result of presenting at one of the Forums.

An outgrowth of the aeronautics forum was the **Semi-Annual Science Forum for Small Businesses** in 1997 in which firms presented their technical capabilities to NASA science managers. This has resulted in participating firms obtaining \$40 million in prime and subcontract dollars since the Forum's inception. One firm, Futron Corporation of Bethesda, Maryland, was selected as a result of its presentation at NASA's Jet Propulsion Laboratory (JPL) to implement a risk management process for JPL's "Genesis" mission. A paper describing Futron's outstanding performance in that effort won a "Best Paper" Award at an international conference on systems engineering.

Meanwhile, NASA decided to further expand the high tech capabilities of small disadvantaged businesses by leveraging the expertise of its major prime contractors with the establishment of a **Mentor Protégé Program**. Unlike the Department of Defense, NASA did not have existing legislation that automatically put a program in place. Nevertheless, under the leadership of the OSDBU, a unique program was crafted using the agency's regulatory authority.

Under this program small disadvantaged businesses are being mentored in such complex areas as ground segment-to-spacecraft integration; test and flight operations from launch to orbital checkout; and, flight control and training automation.

Through the assistance of the programs described above, NASA cleared the "quality" wall of the QQI initiative.

²² Wilfong, Hank, "The Goldin Touch," **Minority Business Entrepreneur**, Sep/Oct 1992, p. 50

²³ "Report on the Performance of NASA's Office of Small and Disadvantaged Business Utilization (OSDBU) in Achieving its Top 10 Priorities for Fiscal Year (FY) 2000", **National Aeronautics and Space Administration**, December 2000

²⁴ *Ibid*

Today, about two-thirds of the dollars awarded to small disadvantaged businesses in prime contracts from NASA are for high tech services.

Institutionalization

All of the early-established initiatives that have caused NASA to increase the prime and subcontract dollars going to small, minority and women owned firms have been made permanent fixtures in NASA's procurement system. For example, the Uniform Methodology for Determining Small Disadvantaged Business Subcontracting Goals is now a NASA Policy Directive.²⁵ The Mentor Protégé Program is now a NASA Supplement to the Federal Acquisition Regulations,²⁶ as are a host of the other innovative acquisition strategies for small businesses described elsewhere in this paper.

6. INDEPENDENCE FROM NASA CONTRACTS

NASA's ultimate goal is to ensure that the small, disadvantaged, and women-owned business experience in contracting with NASA equips them to independently sustain themselves by acquiring contracts and subcontracts with *other* Federal agencies and their prime contractors, as well as with entities in the private sector and the international markets. It is also hoped that such firms will gain financial independence by commercializing critical NASA technologies.

Thus, in 1999, at the direction of the NASA Administrator, the OSDDBU, in association with NASA's Minority Business Resource Advisory Committee, conducted a study to determine whether high tech small disadvantaged businesses that were in the 8(a) program and which contracted with NASA were still viable after their graduation from the program.

This would be very useful information since the last Government-wide study conducted on this issue was done in 1988 by the U.S. Senate Committee on Small Business. That study showed that 21-30 percent of the graduated 8(a) firms had gone out of business, and that 44 percent were either not doing well, or doing just well enough to get by. Fifty-eight percent (58%) of the respondents said that "graduation" had a devastating effect on their businesses. The report concluded that the 8(a) Program was not preparing firms for the post-graduate competitive market.²⁷

²⁵ See NASA Policy Directive 5000.2

²⁶ See NASA FAR Supp. 1852.219.72, *et seq.*

²⁷ "Small Business Administration: Status, Operations, and Views on the 8(a) Procurement Program," **General Accounting Office**, GAO/RCED0-88-148BR, May, 1988, p. 18.

NASA's study,²⁸ which closely followed the schematic approach of that of the U.S. Senate Committee report, had totally different results. It showed, for example, that 62 percent of the firms that had completed their first 8(a) contract with NASA were now doing business with other parts of the government, indicating that their experience with the space program made them competitive and able to win work with other Federal agencies.

Sixty-eight percent (68%) of the graduates surveyed were currently doing work in the commercial market, while thirty percent (30%) reported that they had contracts in the international market.

Indeed seventy percent of the 8(a) graduates surveyed *directly* attributed their success and development to their NASA experience. Another seventeen percent (17%) *indirectly* attributed their current success to NASA.

Some of the comments of those companies surveyed were as follows:

"We developed a system for Kennedy Space Center and later used the technology to start a new company that concentrates on research and development for water treatment in Central America." AJT Associates.²⁹

"If it were not for NASA, my business would not have succeeded. We gained valuable experience..." Tal-Cut Company.³⁰

"Our work at NASA was highly regarded and had high visibility. We established a good reputation with the agency and other business entities..." W.T. Chen & Co.³¹

Thus, it can be said that NASA is more than achieving its goal of empowering its small disadvantaged businesses to become independent of its contracts.

7. BECOMING THE WORLD MODEL SMALL BUSINESS PROGRAM

Similar to NASA's desire to be the world leader in space activities, the agency also seeks to set the pace around the globe with its small and disadvantaged business utilization program. All indications are that it has achieved its purpose. Note some of the examples below:

In 1995 the U.S. General Accounting Office (GAO) the investigative arm of Congress, indicated in a report that, "Officials of small and minority business associations cite the NASA Office of Small and Disadvantaged Business

²⁸ "A Report for the NASA Administrator on the Status of NASA High Tech 8(a) Graduate Contractors," **NASA Minority Business Resource Advisory Committee**, July, 2000.

²⁹ *Ibid* at 40

³⁰ *Ibid* at 39

³¹ *Ibid*

Utilization as a model for other OSDBU's because of its initiatives to help meet the agency's goals."³²

In 1996 President Bill Clinton stated in a one-on-one business magazine interview that NASA "...has an extremely effective minority business program."³³ In 1998, the SBA stated that, "NASA is the best agency in the Federal government in terms of monitoring the ...subcontracting performance of its prime contractors.... We hope to make that kind of oversight government wide."³⁴

And in 1999, the GAO remarked that, "NASA's internet-based procurement system is a possible model for future government-wide contracting opportunities."³⁵ In 2000 NASA became the first and only OSDBU in the Federal government to become ISO 9000 certified.³⁶

In 2001 President George W. Bush conferred the Associated Administrator for Small and Disadvantaged Business Utilization with the "Presidential Rank of Distinguished Executive." It is the Federal Government's highest honor for a member of the Senior Executive Service and was the first time such honor has ever been bestowed to the head of an OSDBU in any Federal agency.

Indeed, since 1992, the NASA Administrator and members of the NASA OSDBU staff have received no less than 40 major awards and citations from such entities as the U.S. Small Business Administration, the National Association of Small Disadvantaged Businesses, the National Contract Management Association, the U.S. Department of Commerce, the Asian American Business Roundtable, the U.S. Pan Asian American Chamber of Commerce, the Latin American Management Association, the National Women's Business Enterprise Council, to name just a few.

In addition the Associate Administrator has spoken as an invited guest in seven foreign countries about NASA's small business program. In 1999 he received the "Special Honor Award" at the International Conference of Small and Medium Enterprises in Bombay, India. It is the highest international honor for initiative, innovation,

leadership and commitment in the small business program arena.

He is currently the co-chair of an International Task Force that will publish the "International Best Practices Guide for Utilization of Small and Medium Enterprises." Moreover, foreign delegations often visit the OSDBU for information about NASA's approach to small business utilization. In 2001 the NASA OSDBU hosted summer interns from Brazil, who were sent from that country's equivalent of the Small Business Administration, to learn more about NASA's program

Yet, having a model small and disadvantaged business utilization program was not without its challenges. Along the way NASA faced Supreme Court case interpretation hurdles,³⁷ seeming conflicts with certain phases of Federal-wide acquisition reform,³⁸ and isolated incidents of delayed buy-in to the initiative by various agency personnel.

What prevailed, however, was NASA's resolve to stay the course. Every obstacle to progress in the program was seen as a mere distraction to be overcome. Every potential problem was handled by having all of the relevant agency players involved. In 1996 NASA brought in an outside consultant to teach a quarterly course at its different field centers entitled, "Socioeconomic Procurement as a Business Imperative."

The premise of this one-day course was to show the value added benefit of utilizing small disadvantaged businesses even if there were no laws or regulations requiring it. No question or issue was forbidden from discussion. In fact the group itself provided most of the answers to the most difficult questions. The seminar is one of NASA's most highly-rated programs, and the individuals who begin the course by being most resistant to its premise are usually the most supportive by the end of the day, after having all of their questions and concerns addressed. The course has served to develop an army of mini-advocates for small business within the agency.

In the case of NASA the challenges actually served to make the program stronger, as it forced senior officials, technical representatives, procurement specialists and small business experts to prove to themselves each time the rationale for the agency's actions with regard to its small and disadvantaged business program. Most importantly, however, is that it forced them to work together as a team and resolve problems just as they would any technical issue within America's Space Program.

³² "Information on Eight Small and Disadvantaged Business Utilization Offices," **General Accounting Office**, GAO/RCED-95-137, April 1995, p.8

³³ Latham, Weldon H., "Measure for Measure," **Minority Business Entrepreneur**, Sept/Oct 1996, p.38

³⁴ "SBA Plans to 'Put Some Teeth' into 8(d) Subcontracting Enforcement," **Minorities in Business Insider**, May 15, 1998, No. 98-10, p.6

³⁵ "NASA Procurement System May Become Model for Government Wide Initiative," **Minorities in Business Insider**, March 10, 1999, p.3

³⁶ "NASA Small Business Office Receives ISO 9001 Certification," **Minority Business News USA**, August 15-September 15, 2000

³⁷ "Supreme Court Ruling Won't Slow NASA Program," **Space Business News**, June 28, 1995

³⁸ Thomas, Ralph C. III, "Contract Bundling," **Minority Business Entrepreneur**, Jan/Feb 2001, pp. 16-22

8. CONCLUSION

NASA's approach to small and disadvantaged business utilization has been a proven success for both the agency and the small businesses involved. It has helped America's space program reduce costs and perform higher quality work and deliver better goods and services. Most important, it has assisted the space agency in performing its mission better, while broadening its base of support with the American public.

REFERENCES

Ralph C. Thomas III, "A Mission Imperative: NASA's Innovative Utilization of Small Businesses in the High Tech Service Arena," *Linkage*, Summer 2001, pp. 38-39.

Ralph C. Thomas III, "The Model OSDDBU Program," *Opportunity Quarterly*, Winter, 1996, p. 2

NASA Office of Small and Disadvantaged Business Utilization Website: www.hq.nasa.gov/office/codek



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